THE MODEL ENGINEER

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The MODEL ENGINEER

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SMOKE RINGS

Our Cover Picture

● WE ARE indebted to Metropolitan-Vickers Limited for the night scene at Falmouth Docks, floodlit by their 1000-watt lamps. The speedy turn round of our ships is a major factor affecting our economic recovery, and in this respect where night shift work becomes imperative, planned illumination plays an important part, not only in speeding the work, but also as a safety measure affecting the workers personally.—P.D.

Letters of Condolence

● FROM ALL over the world, letters and cablegrams continue to reach us, as Mr. Percival Marshall's friends learn the sad news of his death. Our first intention was to publish some of these letters, or extracts from them, as nearly all contain some tribute to our late editor or appreciation of his fine qualities. However, as the number of letters now runs into some hundreds, the question of deciding which shall be published and which shall not has become so difficult that we have reluctantly abandoned the idea. We know that P.M.'s friends will understand our difficulties, which he himself understood so well, and we hope that the decision we have taken is one which he would have endorsed.—P.D.

A Memorial to Percival Marshall

● A NUMBER of readers, on hearing of Percival Marshall's death, have sent us sums of money to be placed in a fund to provide a fitting memorial to his name. The form such a memorial should take has been left for us to decide, but prevalent among the suggestions received is the purchase of a presentation cup. Accordingly, we have decided that the fund shall be devoted to this purpose, and a cup will be purchased, to be known as "The Percival Marshall Cup." It will be competed for annually, and will be awarded at THE MODEL ENGINEER Exhibition for the model adjudged to be the model of the year.—P.D.

Home-made Lathes

● SEVERAL READERS of THE MODEL ENGINEER, faced with the difficulty of obtaining a lathe under present conditions, have risen to the occasion by improvising or constructing a serviceable lathe for themselves. The results of these enterprises have often been described in THE MODEL ENGINEER, and in at least one case, the subject of the series of articles recently concluded in these pages, a machine of outstanding design and quality has been produced. Readers are constantly asking for a standard design of a

lathe specially suited to amateur construction, but while the desirability of such a design is beyond question, there are great practical difficulties in complying with their request. In the first place, the size, essential features and equipment required for such a lathe as expressed by individual readers vary widely, and could hardly be covered by a single design. Secondly, the supply of castings and other material for construction is at present hardly less difficult than that of finished lathes, and members of the supply trades are pessimistic as to the chances of being able to meet demands. Thirdly, the prospects of success in constructing a lathe must depend, not only on the skill of the constructor, but also on the equipment available, and by no means least, the means of testing the final accuracy of the product. Constructional designs for lathe accessories and simple machine tools, such as drilling machines or grinders, have often been published in THE MODEL ENGINEER, but while one can construct any of these appliances if a lathe is available, the argument does not work in reverse. On the other hand, the worker sufficiently skilful to produce a lathe by hand-tools or other primitive methods, would probably need neither a design nor working instructions to assist him. Successful designs and inexpensive sets of castings for lathe construction have been marketed in the past, but these lathes were of a very simple type without either the elaborate equipment or the accuracy which is desirable, or even necessary, to enable the model engineer to produce work in keeping with modern requirements. Readers who have worked out a successful solution to their individual difficulties, are encouraged to describe these for the benefit of other readers who are held up for the lack of machine tools.—E.T.W.

Photographic Competition

● ENTRIES FOR the Photographic Competition, announced in THE MODEL ENGINEER for May 6th, are now arriving, but with a few exceptions the quality of the photographs so far received has been rather disappointing. If you have the model which in your opinion could be the subject for a cover picture, why not have it photographed and send us a print as an entry in the competition? Even if it does not win a prize, it will serve as a record of your achievement, which can be carried around and shown to interested friends more conveniently than could the model itself. Only just over two weeks remain in which to enter, so let your motto be "Do It Now."—P.D.

The Stroudley Livery

● THE RESTORATION of the L.B. & S.C.R. *Boxhill*, and now the appearance of Mr. J. N. Maskelyne's 7-mm. scale Stroudley 2-2-2 engine *Plumpton* at the recent Model Railway Club Exhibition have, together, raised some discussion as to what should be the correct colour for the main frames. *Boxhill* has them painted black while Mr. Maskelyne has given his model maroon frames, and the difference has been duly noted by several readers who, not unnaturally, are asking for an explanation. The last L.B. & S.C.R. locomotive to run in the old Stroudley colours was the 0-6-2 tank engine No. 591, *Tillington*; but this engine was repainted in the Marsh umber livery in 1917, so a really retentive memory is required to recall the exact details of this engine's appearance before that date. Moreover, all the other passenger engines on the line had had their coats changed some years before. However, Mr. Maskelyne points out that every coloured plate or postcard that he has seen depicting L.B. & S.C.R. engines in Stroudley's colours clearly show maroon-coloured main frames, and all those pictures were produced during the period 1899 to 1909, time enough in which the mistake—if it was a mistake—could have been corrected. In addition to this, he, like that expert "Brighton" enthusiast and historian, Mr. O. J. Morris, sincerely wishes that he could be *certain* that he ever saw black frames on a Stroudley engine before 1905. Can any reader clear up this mystery definitely?—W.H.E.

Steam v. Electric Operation

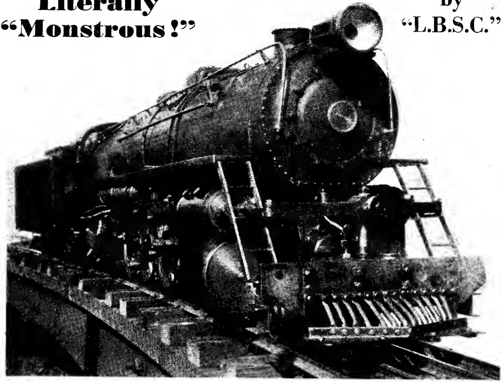
● MY CORRESPONDENCE frequently reveals a sharp division of opinion on the question of whether a miniature locomotive should be driven by steam or by an electric motor. So far as I can judge, the pros and cons stand in the proportion of fifty to fifty! I am not altogether surprised at this; but I am often shocked to notice that the adherents of one idea so frequently deride the other. Each method of drive has its merits, and I feel that this should not be overlooked. The steam-driven model is, naturally, the more realistic; but the building of an accurate, true-to-scale miniature locomotive, so much desired by all purely "locomotive" enthusiasts, is almost impossible in any scale less than $\frac{3}{4}$ in. to the foot, and even then there is more than a probability that the result would be unsatisfactory as a *working* model. Electricity, however, provides a means whereby the locomotive enthusiast can build a miniature as small as $3\frac{1}{2}$ millimetres to a foot, correct in all visible detail, and therefore worth building, and at the same time capable of being set in motion and controlled in such a way as to reproduce the functions of the full-size engine. A great deal of ingenuity has been put into the design and construction of small electric motors intended specifically for this purpose; and that fact, in itself, indicates how strong is the urge to make miniatures which will possess motive power of some sort, no matter what, so long as the work and movements of the prototypes can be simulated. I can see no more cause for derision in this than I can in the idea of a miniature steam locomotive hauling a load of live passengers.—J.N.M.

A Small Locomotive Testing Track

● A READER living in the south-west district of London writes to say that he is "a lone worker" whose chief hobby is small locomotive building. He tells us he now has a 70 ft. railway track in his garden in $3\frac{1}{2}$-in. gauge, and kindly offers the use of this track to anyone in the Streatham area who would care to try out their small locomotives. We shall be glad to forward letters to our correspondent from readers wishing to take advantage of this kind offer.—W.H.E.

Literally "Monstrous!"

by "L.B.S.C."



The last word in big cylinders—three of them!

MORE than once I have had occasion to remark, that when Mr. Edward Adams sets out to do a job, he does it thoroughly; which, incidentally, is a lot more than can be said of many other folk! It may be remembered that way back in 1937 there was a bit of an argument about the respective merits of large and small cylinders. Our worthy engineer-architect friend became very interested in the phase mentioned, and being, as he states, entirely a "free-lance" with only himself to please, determined to put the matter to the test. Keeping up his reputation for thoroughness, to quote his own words, he "rushed in where angels fear to tread," and has never regretted it, the results justifying the means.

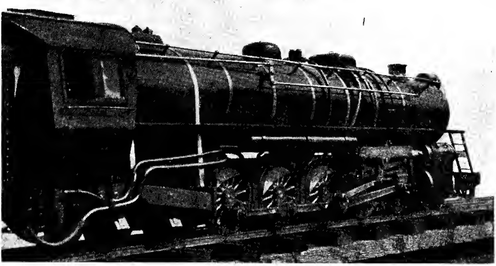
To get in really big cylinders on $2\frac{1}{2}$-in. gauge, a copy of a narrow-gauge locomotive seemed to possess obvious advantages, so our friend took as a basis the New Zealand "K" class 4-8-4 type of engine. He got out a set of drawings in May, 1937, for a three-cylinder engine of the same pattern, with Gresley 2-to-1 gear for operating the valve of the middle cylinder. The engine was not completed until March, 1948, but I don't have to tell you who was principally responsible for the delay in building her, the delay occurring during the war years, as the chassis was completed before 1940.

Some of the dimensions will give relations and friends of our old pal Inspector Meticulous a terrible shock. The three cylinders are $1\frac{1}{2}$ in. bore and $1\frac{3}{4}$ in stroke, the piston area thus being greater than that of a $3\frac{1}{2}$-in. gauge version of the two most powerful four-cylinder express passenger engines at present running in this country, to wit, a L.M.S. "Duchess" or G.W. "King." Ordinary slide valves are used, actuated by a robust Walschaerts gear for the outside cylinders, the inside valve being operated by the before-mentioned Gresley gear. All three cylinders are arranged horizontally, the drive being divided, the outside cylinders driving on the second axle, and the inside cylinder driving the leading axle. Adequate lubrication is maintained by a ratchet-driven mechanical lubricator, with an 80-tooth wheel, so that it continues to function when the engine is running well notched up. The stroke of the ratchet lever varies, owing to the drive being taken from the Gresley gear.

The eight-coupled driving wheels are $3\frac{1}{2}$ in. diameter, the axles running in ball-bearing axle-boxes. The connecting and coupling-rods are on the "Bill Massive" side, and the former have ball-bearing big-ends. In passing, I hope to have a few words to say on the use of needle bearings for small locomotive work, in the not-too-distant future, as I have received some samples of small bearings that are quite suitable for use in our little engines, without rendering coupling-rod bosses, big-ends, and other parts unsightly.

Some Boiler!

The overall dimensions of the boiler are pretty much the same as those I adopted for "Maggie," when "bringing to life" the picture of the imaginary 4-6-2 that formed the heading of the "Pertinent Paragraphs" section of *The Railway Magazine* of 25 years ago, which represented Mr. M. Secretan's conception of a "maximum load gauge" locomotive. The boiler barrel is 4⅛ in. diameter, and contains a combustion-chamber with eight ½-in. water tube struts, thirteen ⅜-in. tubes, and four ¾-in. superheater flues. The grate is 6¼ in. long and 4¼ in. wide. Fittings include four safety-valves, water-gauge, steam gauge (there is another in the tender, same as on the U.P. Mallet) sanding, blower, brake, and injector steam valves, butterfly firehole doors, blowdown cock, and a smokebox throttle. This is a big pin-valve operated by an eccentric, as Mr. Adams wanted to be able to get the full bore available when necessary, and avoid all wire-drawing of the steam. The boiler is fed by an injector and a double eccentric-driven pump of typical Adams design, the barrels being placed back to back, and the rams coupled together by a coupling-rod at the side, driven from an eccentric on the second axle, on much the same principle as coupling-rods on certain types of diesel and Milly-Amp locomotives are driven from a jackshaft. This pump was described and illustrated in these notes some years ago.



Mr. Edward Adams's "Monstrous"

Incidentally, this boiler is the final result of three attempts, and is also a part reason why the completion of the engine was so long delayed. The first boiler failed under pressure test. Owing to the crown-stay girders not being properly attached to the wrapper sheet, they pulled away from it, and let the firebox crown down; so the whole lot was scrapped, and a fresh start made.

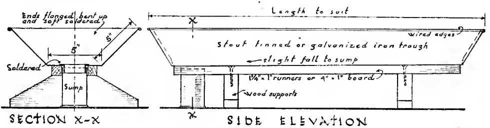
Boiler No. 2 was spoiled by being left too long in strong acid pickle, which ate through the thin tubes. As Mr. Adams had, at that time, no facilities for brazing up the boiler, he put the job out, and the firm who undertook it was responsible for the failure. This brought home to our worthy friend the truth of the old saying that "if you want a job done properly, do it yourself"; so he bought a 6-pint paraffin blowlamp, and made the final boiler himself, which turned out a perfect success in every way. The upper part of the smokebox is removable, similar to the smokebox on the Mallet. The grate and ashpan can be dumped by pulling out the cross-pin; the pony truck is removed for the purpose by undoing one nut.

The tender runs on two four-wheeled bogies, and contains the usual emergency hand-pump and other accessories, also an auxiliary steam gauge, as previously mentioned, and a quick-emptying plug. There is a great deal of riveting work in it, but Mr. Adams now punches up dummy rivet heads by aid of a centre-punch and die, a wheeze also described in these notes from details he supplied. Our friend made all his own patterns for wheels, cylinders, steam-chests and so on. The length of the engine is 3 ft. 1½ in., and the tender 1 ft. 6½ in., so she qualifies for the "Longbody Stakes," along with the Mallet, and my own 2-6-6-4 "Annabel."

How She Goes

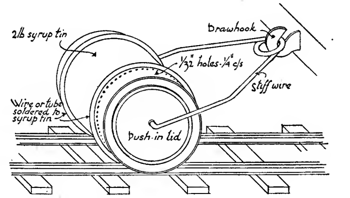
Mr. Adams says that even if he had doubted the efficiency of a big-cylindered engine, the performance of "Monstrous" would have soon put all doubts to rest. The engine has never been tried "all out," but has a sustained drawbar pull of 15 lb. with 60 lb. steam pressure. She will haul her owner easily with only 10 lb. showing on the "clock." The boiler has not the least

difficulty in supplying all the steam required; as a sample of what it will do, the engine has been started off with one adult and three children, with only 15 lb. pressure, and without touching the fire, has run for half-a-mile without a stop, finishing up with the safety-valves blowing off at 70 lb., and a full glass of water. The highest recorded speed is a fraction over $6\frac{1}{2}$ miles per hour—a higher speed is not safe on Mr. Adams's circular track—running well notched up, with a very light blast, only a very small amount of ash being drawn into the smokebox. Mr. Adams says that the possibilities of this engine are nothing near fully explored, and he intends to make some tests, the results of which will make interesting reading, especially to those folk who cling to the "small-bore theories."

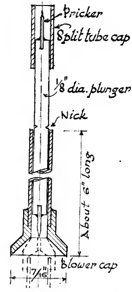


Mr. Adams's washing tank

I might here add a note that will give the latter fraternity "furiously to think," as the saying goes. It is argued that a small bore cylinder will give the power, if the steam pressure is raised sufficiently to apply the same force to the piston, as exerted by a lower pressure on the bigger piston. Quite right—*but what happens if you cannot keep up the higher pressure*? For example, regular readers of these notes may remember my description of the commercially-built $2\frac{1}{2}$-in. gauge "Cock-o'-the-North" that was useless as originally made, and which I took in exchange for a rebuilt 4-4-2 that would do the job, and keep on doing it. I rebuilt "Cocky" by reboring the cylinders, titivating up the valve-gear, and making up a new boiler for it to my own design. Now the cylinders are only a shade over $\frac{5}{8}$ in. bore; and to get anything like a pull out of the engine, I have to work at 120 lb. pressure, at which the engine will haul my weight and run at a good speed. My boiler, which makes enough steam for about six $\frac{5}{8}$ in. cylinders if worked to capacity (that isn't meant as a joke; the boiler would actually do it) has no difficulty on keeping "on the pin"; and to the uninitiated, the engine appears to be a perfect success. But let the pressure drop to 60 lb., and see what happens! She needs all the regulator and all the lever to keep going, and the power is all gone by the time she has dropped to 40 lb., when there is barely enough "Sunny Jim" left in her to pull the empty car. With the original arrangement, she wouldn't pull her own tender at 40 lb.



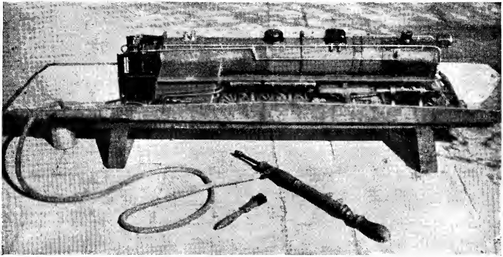
A novelty in sanding gear



Blower pricker

Old "Ayesha" will start my weight easily with 35 lb. "Fernanda," the piston-valve 4-6-2 which has $\frac{13}{16}$ in. bore cylinders and a similar boiler to "Cocky," once started Mr. Grose and a friend, on my road, with 35 lb. on the gauge and only a few live embers on the bars, and took

them about three laps of my line. They called one evening just as I had "shut down." You have read above what Mr. Adams's "Monstrous" will do with the 10 lb. and 15 lb. respectively. It is exactly the same in full-size practice. A high-pressure small-cylindered engine is all right as long as the pressure is all-present-and-correct-sergeant, but ask any driver or fireman what happens when for some reason or other, the pressure cannot be maintained. There are such as big in diameter as the driving wheels. The results are seen in present day practice on that side of the big pond. In the 1947 edition of the *Locomotive Cyclopedia*, a copy of which was recently presented to me by Mr. Chas. Haller, there are illustrations of modern locomotives with cylinders having comparatively enormous bores; 26 in. bore and 32 in. stroke is quite a "standard" size for a 4-8-4, and there are many bigger still. One built for the Norfolk and



A locomotive takes a shower bath

things as tubes and stays leaking, bad coal, clinkers, dirty boiler, and so on, which stop the gauge needle from keeping where it belongs; and in that case, the small-cylinder engine is cattled. Many L.M.S. drivers and firemen prefer the Hughes-Fowler "crabs" (the 2-6-0's with 21 in. by 26 in. cylinders and 180 lb. boiler pressure) to the Stanier engines of similar classification with 18 in. by 28 in. cylinders and 225 lb. boiler pressure, although there is little difference in the rated tractive effort. Why? Simply because when the pressure falls for any reason, the big cylinders sustain the pull; the smaller ones don't. Many enginemen on the Southern swear by the big cylinders of the Brighton "K" class 2-6-0's, saying that they are "boss" of any load that could be put behind them.

At the time I was over in U.S.A. the locomotive fraternity were carrying out experiments in sustained tractive effort at high speed; and it was found that by adding an inch or so to the cylinder diameter of one particular class alone, the maximum tractive effort, which had previously reached its peak at 37 miles per hour, was sustained until the engine had reached 55 miles per hour, with a corresponding increase in the maximum speed. The engine was just as economical on fuel and water as before, and there was no more tendency to slip when starting; any driver who knows his job, can start away without slipping, no matter if the cylinders were Western R.R. has cylinders 27 in. by 32 in., carries 275 lb. pressure, and has a tractive effort of no less than 73,300 lb. (makes our "Kings," "Duchesses" etc. look very small, doesn't it?) whilst the latest effort on the Pennsylvania has *four* 22-in. cylinders, double the cylinder capacity of the Brighton "Baltic" tanks, which had the biggest cylinders in this country.

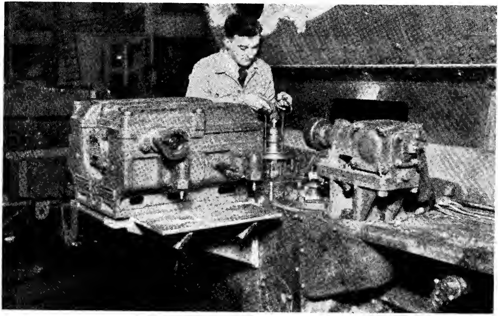
Just one other point. Anybody who believes in fitting small cylinders and boosting up the boiler pressure to get the power, had better be sure that they are good boilersmiths! There are hundreds of boilers that have been made by first-timers, novices, raw recruits and so on, that are safely operating today at pressures around the 80 lb. mark, and will continue to do so "till the cows come home"; but if they were called upon to generate and sustain 150 lb. pressure, just for the sake of reducing the bore of the cylinders, they wouldn't last the proverbial five minutes. The firebox sides would soon resemble a buttoned cushion, the crown sheets begin to sag, and probably a whole crop of Welsh vegetables would begin to sprout. It is far easier, *and safer* (very important that, especially where there are kiddies) to build an engine with big cylinders, moderate boiler pressure, and plenty of superheat, than a high-pressure small-cylindered one. The former is far more economical, and easier to handle, besides being less susceptible to changes in pressure; also,

(*Continued on page* 581)

*THEME and VARIATIONS

by J. N. Maskelyne, A.I.Loco.E.

IN the case of the engines being fitted with British Caprotti valve-gear, the opportunity has been taken of completely redesigning the locomotive to suit the valve-gear rather than adapting the valve-gear to an existing design. The cylinders are of a special design made as steel castings in Crewe Locomotive Works, and great care has been given to the layout of the steam and exhaust passages. The steam inlet is on the outside of the cylinder, whilst the exhaust passages are next to the frame ; this arrangement has been applied because it gives straighter passages than those obtained with the more usual arrangement of British Caprotti valve-gear. Cast-iron liners of cylinder quality are pressed in to form the cylinder barrel while the cages for the poppet cambox have been supplied by Messrs. Associated Locomotive Equipment Limited, to their usual specification. The valves are seated by steam pressure taken from the regulator direct to the cylinder casting, and, therefore, when the engine is coasting, the poppet-valves are permitted to drop off their seats, giving the effect of a large by-pass on the cylinder.



View showing Caprotti cam-box mounted on temporary platform whilst a valve cage is being lowered into position

In the case of engines with roller-bearings, the drive for the British Caprotti valve gear is mounted on a facing formed on top of the roller-bearing casing. For plain bearings the drive is mounted on the axle and comprises a casting with bearings on the axle and houses a spur-wheel reduction drive to a pair of bevel-wheels which rotate the main driving shaft. This has Hardy-Spicer couplings to allow for the movement of the axle, and drives two cross-shafts by means of bevel-gears mounted in a box supported from the smokebox saddle.

Each of these shafts has Hardy-Spicer couplings and splined joints connecting to the camboxes mounted on each cylinder. The drive for the camshafts consists of oil-tight assemblies right from the axle to the valve boxes, and this should ensure long life and low oil consumption.

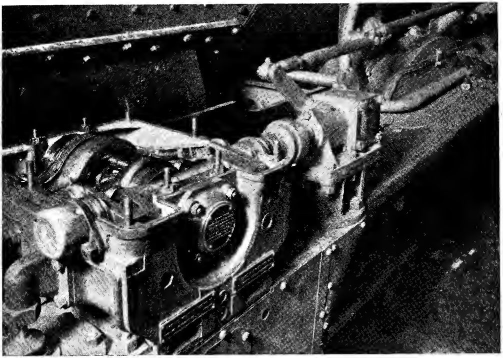
The reversing-gear in the cab has been so arranged that the same number of turns are required to work the gear from full forward into full reverse as with the standard type of valve gear, and this has been done to avoid any confusion on the part of the driver. The reversing-rod from the cab is coupled up to a shaft which transmits the motion to bevel-gear boxes and by a simple coupling to the camboxes on each cylinder.

*Continued from page 564, " M.E.," May 27, 1948.

Particular consideration has been given in the layout to give access to all points likely to require attention, and to the requirements for a quick dismantling and re-assembly when valves require examination. This particularly concerns the easy removal of the cambox, which is arranged to slide out on a temporary platform in order to allow the valves to be inspected.

fitted with piston-valves and Timken roller-bearings, has been provided with an outside form of Stephenson's link-motion in place of the standard Walschaerts valve-gear.

The ten engines form part of a group of 30 locomotives of which ten have piston-valves and roller-bearings, ten have British Caprotti valve-gear and roller-bearings, and the remaining ten



View with top of Caprotti cam-box removed to show cams and the method of reversing

British Caprotti valve-gear and plain bearings. As comparative cost records are to be kept of these engines, in order to assess the relative advantages that accrue from the various arrangements, the opportunity has been taken to try one further experiment in order to enable a comparison to be made of the advantages claimed for Stephenson valve-gear.

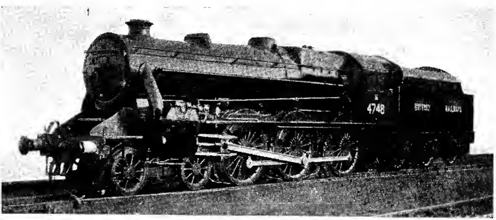
In addition to the experimental features to which reference has been made, three engines fitted with piston-valves and Timken bearings are also being provided with double chimneys and electric lighting; also three engines being fitted with British Caprotti valve gear and Timken bearings are having double chimneys, steam-operated cylinder cocks and electric lighting. The turbo-generators and equiment for the latter are supplied by Messrs. J. Stone & Co. Ltd.

All the engines are fitted with the now standard L.M.S. features of self-cleaning smokeboxes, rocking grates, self-emptying ashpans and blowdown cocks.

I think I need scarcely say that these experimental details were most fascinating to see and study, not only on the finished engines, but also in various stages of assembly and manufacture in the works. However, to me, the most intriguing of all was engine No. 4767, and I am hoping that I may have opportunities of meeting her again, in service; for her principal feature is a revival of an old idea, but in a very modern form. This locomotive which is the last of a batch of ten

The feature of the Stephenson's link-motion is the fact that the lead increases as the engine is notched up, whilst with the Walschaerts gear the lead remains approximately constant. It is fairly clear that, at starting and at low speeds when the engine is working at long cut-off, excessive lead is undesirable. On the other hand, when running at high speeds and short cut-offs, in order to enable the maximum quantity of steam to enter the cylinder, a considerable lead is essential, and these are just the conditions which the Stephenson valve-gear is able to satisfy.

The last previous application of the valve-gear in this form to a main-line locomotive in this country was, apparently, that on William Dean's G.W.R. single locomotive, No. 9, built in 1884.



Class 5P 4-6-0 No. 4748 (Caprotti valve-gear and Timken roller-bearings)

In the new design, a double return crank provides the motion given by the usual conventional two eccentrics, and the whole valve-gear has been worked in simply, by suppressing the motion girder of the standard Walschaerts valve-gear arrangement and re-arranging the drive to the standard valve-spindle crosshead. The full-gear valve-travel is the same as with the Walschaerts gear, but the increasing lead characteristic of the Stephenson gear gives increased steam-port openings at the shorter cut-offs.

Literally "Monstrous!"

(*Continued from page 578*)

there is much less chance of pistons blowing, and steam escaping from glands, or blowing out cover joints. Follow the "words and music"—all my experimenting has been placed at your service—'nuff sed!

Three More Adams Gadgets

Practically everybody who operates little coal-fired locomotives, has suffered the inconvenience of a "bung-up" of a single-jet blower nipple. After a few experiences of this kind, Mr. Adams became tired of coining new words for the dictionary of railroad Esperanto, and made a self-locating blower pricker instead, which is operated down the chimney, and does the job in a few seconds. It is just a sort of weeny bell centre-punch. The plunger rod has a different-sized pricker at each end; and the end not in use, is covered by a cap, to avoid pricking the user's fingers as well as the blower nipple.

The sander is made from a 2 lb. syrup tin with push-in lid. Two wire flanges are soldered around it, fitting between the rails, and two rings of 1/32-in. holes are drilled at ¼ in. centres all around the tin, directly over the centres of the rails. A hole is made in each end of the tin, to take the ends of a wire handle which can be slipped over the drawbar hook of tender or flat car. This handle is easily sprung off for refilling the tin. As the latter rolls along the rails, the sand is well stirred up, and trickles out through the little holes on to the rail heads. There is no need to sift the sand before using, as anything that will not pass through the holes, remains in the can, and can be thrown away when next refilling.

The drawing of the washing trough is self-explanatory, and the small picture shows a locomotive all ready for a bath. The cleaning instrument is just an ordinary garden syringe with a fine spray nozzle, and paraffin is used as a cleanser. The spray comes out with considerable force, thoroughly cleaning every part, the surplus returning to the sump and being used over and over again until it becomes too dirty, when it is finally used for lighting-up purposes. Any solid matter settles in bottom of sump, which is detachable. Mr. Adams says it needs little effort to render the locomotive bright and shiny, and suggests that the gadget could be used for cleaning down a locomotive before painting, if petrol is used instead of paraffin (by kind permission of the M.F.P ??) or the engine sprayed with thin oil, if it has to be put away for any length of time. Mr. Adams's own trough is 4 ft. long, enabling it to accommodate the U.P. Mallet. He also suggests that a washing outfit of this description might be found very useful at a club track, members being enabled to clean their engines easily and quickly before taking them home.

IN THE WORKSHOP

by "Duplex"

12—The Surface Gauge

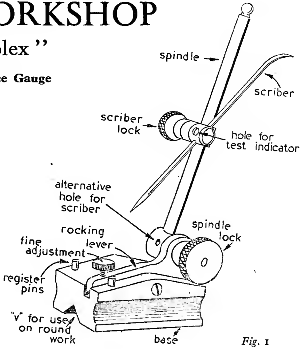


Fig. 1

IN a previous article, the surface gauge has been referred to in connection with setting work when drilling in the lathe ; and as this appliance is an indispensable part of the workshop equipment, it is proposed to deal with its construction and use in further detail, mainly for the benefit of those with limited experience, who have not so far made full use of this adaptable device.

The drawing (Fig. 1) illustrates the pattern of surface gauge manufactured by Messrs. Starrett, and also by Messrs. Moore & Wright.

The heavy base member, made of cast-iron or hardened-steel, has a deep V-groove machined on its under surface to enable the gauge to obtain a bearing on round work. As will be seen in the drawing, a slot is machined in the upper surface of the base to accommodate the pivoted rocking lever which provides a means of fine adjustment, under the control of the adjustment screw, and also serves as an attachment for the spindle pivot with its draw-sleeve and locking-screw.

The dissembled parts of the pivot mechanism are shown in Fig. 2, where it will be seen that the draw-bolt is clamped to the rocking lever by means of coned surfaces in order to afford precise location. In some patterns of surface gauges the inner end of the draw-bolt sleeve is also made coned where it engages with the rocking lever.

The scriber clamp member is of similar construction and provides for universal movement of the scriber point.

In some models, the scriber clamp sleeve and draw-bolt are cross-drilled with a $\frac{1}{4}$ in. diameter hole, to enable the dial test indicator to be mounted in this position in place of the scriber. As shown in the drawing, two register pins are carried in the base, but sometimes four such pins are fitted. These parallel pins are very accurately fitted and are normally retracted within the base, so as not to interfere with the seating of the gauge when used on the surface plate.

When, however, the surface gauge has to be located against, say, the lathe bed, these pins are pushed downwards into the position shown in Fig. 3, and the gauge is then guided in a direction parallel with the lathe axis.

It is essential for accurate marking that the fine points at either end of the scriber should be kept in good condition and really sharp. Should the points become damaged by misuse, they may have to be reground on a fine carborundum wheel, but, at the same time, great care must be taken not to draw the temper of the steel and render it too soft for efficient working.

The points can, as a rule, be resharpened on an oilstone, and for this purpose, a hard stone of the Arkansas type is preferable, for not only will it give a fine finish to the point, but its hard texture prevents the surface of the stone being easily scored.

Rule Stands

When adjusting the height of the scriber point of the surface gauge, it is essential that the rule should be maintained in a truly vertical position to ensure an accurate setting. Further, a really stiff rule should be used, so as to avoid any inaccuracy arising from the rule bending or failing to stand upright.

Although this can be provided for by clamping the rule to a small angle plate resting on the surface plate, it will usually be found more convenient to employ a rule stand specially designed for the purpose, such as the device which was made at one time by Messrs. Starrett, and shown in Fig. 4.

This holder comprised a heavy steel base with a bevelled shoulder against which the rule was pressed by a pad-piece actuated by means of a lock-screw.

A rather similar rule stand was made by the writers prior to the appearance of the Starrett holder ; this is designed to hold rules of from $\frac{9}{16}$ in. to 1 in. in width, that is to say, standard rules of from 3 in. to 12 in. in length.

Making a Rule Stand

As there are, no doubt, many who would like to make the useful appliance illustrated in Fig. 5, we will give a description of its construction; but there is, however, no need for either the dimensions given, or the machining methods suggested, to be exactly followed, and any modifications to meet special requirements can be introduced as found necessary.

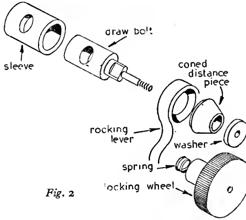


Fig. 2

The holder is made from a 2-in. cube of mild-steel, and in order to maintain accuracy of alignment during machining, the base and four sides should be made flat and square with one another by filing and scraping; it may, however, be found that an accurate result can be obtained by shaping, or by holding the work in the four-jaw chuck and then facing the surfaces in the lathe.

groove carrying the clamping pad. The limit of the curved end of this groove is indicated by the line, D, scribed $\frac{9}{16}$ in. from the right-hand edge of the front face.

The vertical centre-line, E, of the operating screw is then scribed, with the jenny calipers, $\frac{5}{16}$ in. from the front face on the two opposite sides of the block.

Finally, the position of the shoulder is indicated by a vertical line, F, scribed $\frac{1}{4}$ in. from the right-hand edge of the front face.

The block is now ready for machining, and when mounted on the drilling-machine table, a No. 13 drill is put right through from the centre corresponding to G on the opposite side of the block.

This is followed by a $\frac{3}{8}$ in. drill fed to a depth of $1\frac{7}{16}$ in.

A flat seating at the bottom of this hole is then formed with an end-mill or D-bit at a depth of $1\frac{1}{2}$ in.

The No. 13 drill hole is now finished to size with a $\frac{3}{16}$ in. reamer to form the bearing for the clamping screw.

Next, the block is mounted on the lathe cross-slide with the centre-line A set at the lathe centre height.

The block is then adjusted, as described in a previous article, to lie at right-angles to the lathe axis.

A $\frac{3}{8}$-in. end-mill or two-lipped slotting cutter is mounted to run truly in the four-jaw chuck, or in a mandrel collet, and is used to machine out the groove for the clamping-piece to meet the diameter of the $\frac{3}{8}$-in. hole previously drilled, that is to say, to a depth of $\frac{5}{16}$in. measured from the front face.

The leading edge of the cutter is fed to the right as far as the line D, which, as shown in the drawing, lies $\frac{9}{16}$ in. from the right-hand edge of the block.

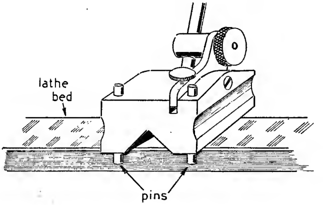


Fig. 3

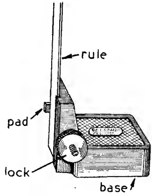


Fig. 4

The next step is to mark-out the work in accordance with the drawing in Fig. 6. With the block standing on its base on the surface plate, the centre-line, A, is scribed, with the surface gauge, 1 in. from the base on the front face and on the two sides.

Two lines, B and C, one $\frac{3}{16}$ in. above and the other $\frac{3}{16}$ in. below the centre-line, are scribed on the front face to denote the edges of the

To form the undercut abutment shoulder for the rule, the block is again mounted on the saddle, but with the dimension line F of the shoulder lying horizontally and facing the headstock.

The machining is carried out with the fly-cutter head, described in the article of January 29th, mounted in the self-centring chuck and with the tool secured in the angular position in the head.

In order to undercut the shoulder, the tool point must be ground and finally oilstoned to the form shown in Fig. 7, so that clearance is provided behind the point in relation to the vertical work surface, but the other cutting edge is shaped as a form tool, or angular cutter, to form the 60-deg. undercut surface required.

The tip of the tool is set to the scribed dimension line of the shoulder, and the fly-cutter is then used to cut the surface back for 3/32 in.

Fig. 5

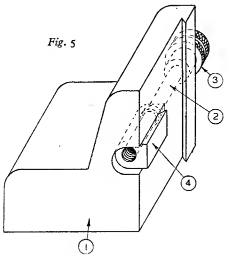
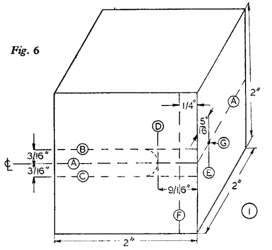


Fig. 6



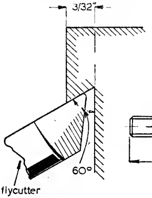


Fig. 7

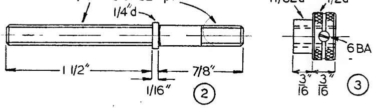


Fig. 8

Only light cuts should be taken in order to avoid chatter and to form a finely finished surface.

To machine the undercut, the work is backed away and the tool-bit is set out in the carrier head until the radius on which the tip lies is increased by 3/32 in.; this setting can readily be carried out with the aid of the dial test indicator, as previously described.

The work is now brought up so that the tool's cutting edge exactly touches the previously machined surface, and a final cut is taken with a very slow feed right across the surface of the work.

If, as an alternative method, the block is mounted on the vertical slide, this will facilitate setting the work to the exact centre height for forming and undercutting the shoulder; or, again, the shaping machine can be used for the job.

During these machining operations the lathe saddle should be clamped, and when available the power feed of the cross-slide should be used.

To finish the base-piece, it should be formed to the outline shown in the drawing, or to any other shape desired, by means of the hacksaw and file, or in the milling or shaping machine.

After completion of the block, its under surface should be again scraped true on the surface plate to correct any distortion that may have arisen as a result of cutting the metal to shape.

The next parts to tackle are the feed-screw and its finger-nut shown in Fig. 8.

The spindle is a straightforward piece of turning, and it can be threaded at the ends, in accordance with the drawing, either B.S.F. 32 t.p.i. or Model Engineer 40 t.p.i.; it should also be made a good turning fit in its bearing in the base block.

The knurled nut is fitted with a 6-B.A. grub-screw to secure it to the spindle after the end adjustment has been made.

It is a good plan always to fit a brass pad under a grub-screw that bears against screw

threads; this gives a much firmer hold, as the soft metal is pressed into the screw threads without causing them damage, or forming a flat which may upset future adjustments.

It may be found an advantage to cut a screw-driver slot in the end of the spindle to facilitate making adjustments.

The clamp-piece, Fig. 9, is made of mild-steel

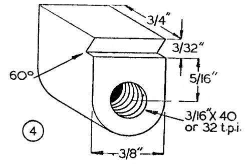


Fig. 9

and is, perhaps, best drilled for tapping by being secured in its slot with a toolmaker's clamp; the drilling centre is then formed with a 3/16-in. drill entered in the spindle bearing.

Before assembly, the face of the clamp-piece is filed to an angle of 60 deg. to engage the edge of the rule.

An Easily Made Rule Stand

The simple but effective rule stand designed by the writers and illustrated in Fig. 10 can be readily made up from a 1¾ in. length of ¾ in. square mild-steel bar. The under surface is filed true and then scraped to a flat finish, whilst the front face is filed to stand at right-angles to the base. Two register pins of 1/16-in. silver-steel, or 16-gauge bicycle spoke, against which the rule abuts, are fitted 9/16 in. from the right-hand edge to accommodate a rule ⅝ in. in width.

The spring clip is made from a strip of 26-gauge spring brass ½ in. in width, and is secured to the base block by means of a 6-B.A. screw and washer. Brass is a better material, than spring-steel for this purpose, as it will not scratch the rule when pressed into place.

The clip is bent so that it presses against the centre of the rule, and it will be seen in the drawing that the two register pins project some 3/32 in. so that the clip lies between them and is thus prevented rotating.

A brass distance-piece, 1/16 in. in thickness, is fitted behind the clip to enable the spring to act effectively.

To use the holder, the rule is sprung under the

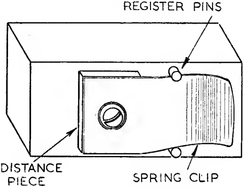


Fig. 10

clip and, with the holder standing on the surface-plate, the rule is then pushed downwards into contact with the surface-plate; at the same time care is taken to see that the rule remains in contact with both register pins.

Unlike the previous pattern, this holder does not obstruct the free edge of the rule when mounted in place.

Although the surface gauge is used chiefly for marking-out work on the surface plate, it is also employed at times, as has been described in a previous article, for setting work, mounted on the saddle, to the lathe centre height.

As one of the commonest uses of the surface-gauge is, perhaps, that of marking-out the centre of round work, this operation will be described in some detail for the less experienced workers.

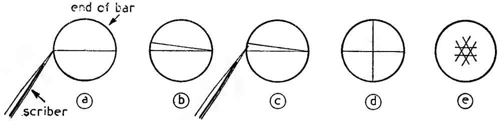


Fig. 11

Let us suppose, for example, that it is required to mark the centre of a short length of round bar. In addition to the surface gauge, a pair of V-blocks will be needed to support the work on the surface plate. If a cast-iron surface plate or marking-out table is not available, a sheet of plate glass will make a good substitute.

In the first place, the flat ends of the bar are painted with marking fluid to enable the lines

formed by the scriber to be clearly seen. Specially prepared, quick drying marking fluid can be purchased from a tool merchant, but if this is not available, the ends of the bar can be chalked, or painted with french polish to which a little whiting, distemper or methylene blue has been added.

The bar is then set in the V-blocks resting on the surface plate, and when the point of the scriber of the surface gauge has been set to the approximate centre height, a line is scribed across the face of the work as shown in Fig. 11 (a); the scriber should be given a slight trailing action so that it does not tend to dig into the surface of the work and form an irregular line. Furthermore, the scriber should be set so that it lies nearly horizontally, as in that position it will mark a cleared line and also it is then not so easily deflected by any irregularity of the surface of the work.

The bar is now turned through an angle of some 180 deg. until the scriber point, as previously set, comes into contact with the end of the scribed line; a second line is then scribed across the face as depicted in Fig. 11 (b).

The next step is to adjust the scriber point to lie midway between these two lines as in Fig. 11 (c), but without moving the bar.

At this stage, in order to avoid confusion, it may be found advisable to repaint the surface; then, as before, two lines are scribed across the face. If these two lines coincide, they then pass through the centre of the circle, but should they not do so, the previous procedure must be repeated until this result is obtained.

It now only remains to turn the bar through an angle of 90 deg., with the aid of a square resting on the surface plate, and to scribe the cross-line as shown in Fig. 11 (d) to indicate the centre of the bar. The other end of the bar is then marked-out without altering the setting of the scriber.

Another commonly-used method of marking the centre of a shaft, mounted in V-blocks, is to set the scriber point to the approximate centre height and to scribe a short line on the face; the shaft is then rotated some sixth of a revolution and a second line is scribed. When this has been repeated until the shaft has made a full turn, it will be found that a small, six-sided figure has been scribed on the end of the shaft as shown in Fig. 11 (e).

Setting the scriber point to the centre of this small area will then enable the centre-lines to be marked out.

It will be observed that one end of the scriber fitted to the surface gauge is curved. This curved end can be used when setting components level on the surface plate. For example, a flat bar is bolted to an angleplate for machining and it is required to set its upper surface level.

The angleplate with the work attached is placed on the surface plate, and the curved end of the scriber when turned downwards is brought into contact first with one end of the bar and then with the other. The setting of the work is then adjusted until the scriber makes light contact equally with either end of the bar.

The importance of setting the scriber horizontally has been pointed out, and in addition, in order to maintain rigidity, the scriber should not be allowed to project farther than is necessary beyond its clamping point. In this connection, Fig. 1 shows that the spindle clamp is cross-drilled with a small hole to carry the scriber in this position after the spindle has been removed. When the scriber, with its curved end downwards, is secured in this hole by tightening the spindle clamp-nut, the curved point can be brought right down to the surface plate for marking-out small work, and when so mounted the scriber is very rigidly held and, at the same time, it is well supported close to the scribing point.

(To be continued)

The Model Power Boat Association

The International Regatta will be held on Sunday, June 6th, at Victoria Park, Hackney, London, E., commencing at 11.30 a.m.

The committee of the M.P.B.A. have been considering matters which were referred back at the recent annual general meeting and have made the following decisions :—

Silencers. It is desired to reduce the "ear splitting" noise of racing hydroplanes due to objections from local authorities in various parts of the country. In order to encourage the use of silencers for both petrol and flash steamer boats, it is hoped that at the Grand Regatta this year test apparatus will be available and a valuable prize will be awarded for the winning boat. A committee will be appointed as judges, as speed, etc., will be taken into consideration.

Club Championship. The object of the club championship is to promote keen competition between clubs forming the M.P.B.A.

All types of boats covered by the rules of the M.P.B.A. are catered for in the scheme. Points will be awarded at M.P.B.A. open regattas; closed club regattas are not eligible for points.

The following five events only will be eligible for the awarding of points.

1. "A" Class racing hydroplanes.
2. "B" Class racing hydroplanes.
3. "C" Class racing hydroplanes.
4. Steering competition.
5. Nomination race for free-running craft.

Points Award. Each craft entering any of the above five events and *completing* the event will be awarded one point.

The winner of any events will be awarded fifteen points. The second place will be awarded ten points, and the third place five points.

The secretaries of clubs wishing to compete for the championship shall keep a record of the regatta performances of all boats belonging to their club, and at the end of the running season send details to the Hon. Assistant Secretary of the M.P.B.A., Mr. A. Rayman, 59, Murillo Road, Lee, S.E.13.

The results will be considered by the committee and the championship awarded to the club having the highest average number of points per member affiliated to the M.P.B.A.

*Swords into Ploughshares

Hints on the adaptation of "surplus" war material for model engineering or utility purposes

Optical Lenses and Components

by " Artificer "

IT is probable that the mechanical and electrical apparatus which has so far been discussed in these articles will be more interesting to readers of THE MODEL ENGINEER than any of the other types of apparatus available on the "surplus" market. As pointed out in the beginning of the series, the wide and profuse variety of electronic apparatus now available is considered hardly within the scope of this survey, though it may be of great interest to a short-wave radio experimenter who has specialised knowledge in this field. There is, however, a possibility that many readers may be interested in another class of apparatus, namely optical instruments, several examples of which are now offered for disposal, and which can be applied or adapted to various purposes within the sphere of model engineering.

Some reference has already been made to aircraft cameras, but this has been concerned mainly with their mechanical details. In cases where the complete camera is available, the component which represents the highest intrinsic value is the lens. Several readers who have obtained or have been offered aircraft camera lenses have enquired to what purpose they can be applied. It is, of course, possible to use the complete camera in many cases, for general photographic work, though there are obvious disadvantages in doing so, not the least of which is the fact that the camera is abnormally heavy and bulky, and uses a type or size of film which would be difficult or expensive to obtain.

Most aircraft cameras work at fixed focus, that is to say, they have no provision for altering the distance between the lens and the film to obtain a sharp definition of objects at various distances. These cameras are permanently set at " infinity focus," which means that all objects at a distance beyond a certain minimum figure, depending upon the focal length and aperture of the particular lens, are sharply focused ; but below this distance, sharp definition cannot be obtained without re-setting the lens.

The Cooke Aviar lens, as extensively employed in aircraft cameras

This disadvantage is, of course, eliminated if the lens is removed from the aircraft camera and fitted to a type of camera already equipped with focusing movement, such as a " stand " or studio camera, or the type of reflex camera popular some years ago. In either case, it may be possible to fit the lens in some kind of focusing mount, the usual form of which is a telescopic arrangement of short concentric tubes with a helical slot or multi-start thread for adjustment. In any case, if the camera has no provision for pre-focusing on a ground glass screen, it will be necessary to calibrate a suitable focusing scale on the camera baseboard or lens mount. This can be done by removing the back of the camera temporarily, fixing a ground glass screen with its matt side exactly on the focal plane (in the case of a film camera this will be in contact with the film rollers) and focusing objects at various *measured* distances. A focusing magnifier or any short-focus magnifying lens, such as a watchmaker's eye-glass, should be used to ensure that the sharpest possible focus is obtained at each distance, before making the scale.

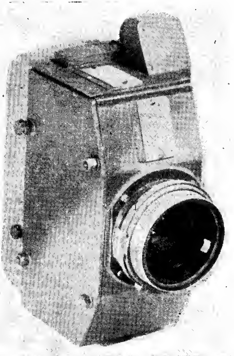
Aircraft camera lenses are generally fitted to heavy mounts, sometimes with additional fittings for filters or anti-mist heaters, and may be difficult to fit to some of the older types of cameras designed for use with small aperture lenses ; it is also possible that the weight and overhang of the lens may overload the focusing slides or the camera front, thereby causing it to sag out of square, or possibly rendering the camera more liable to vibration, which is fatal to good work. This is a typical case of putting new wine into old bottles, and adaptations of this nature should be carried out with discretion.

Quality of Lenses

Only the very best possible lenses are good enough for aerial photography. Therefore, it

**Continued from page* 545, " *M.E.*," *May* 20, 1948.

may be taken for granted that a lens from an aircraft camera is good enough for any purposes within the field of general photography. Nearly all these lenses work at a large maximum aperture, and are highly corrected for all known errors, including distortion, chromatic aberration and astigmatism. (In case these terms may be confusing to readers with no specialised knowledge in optics, it is hardly within the scope of this article to define them in detail, but they are explained in any good photographic text-book. For the present it may be sufficient to say that they refer to errors which have been found troublesome in photographic lenses in the past, and upon which the best resources of optical science have been brought to bear. The wide-aperture "anastigmat" lens may be regarded as the most perfect development in photographic optics.)



Complete torpedo training camera, Mk. IV. (Aero Spares Co.)

"Aperture" in photographic lenses is defined in terms of the relation of the opening at the centre or "node" of the lens to its focal length, expressed in fractional figures, thus f/8 represents an aperture equal to $\frac{1}{8}$ of the focal length, f/4—$\frac{1}{4}$ of the focal length and so on. Many of the lenses from aircraft cameras have apertures as much as f/2.9, typical examples being the well-known Dallmeyer "Pentac" and the Cooke "Aviar," which have been used in focal lengths up to 20 in. for high-altitude work. The diameter of a lens of this aperture and focal length is about 7 in. For most practical purposes, smaller lenses with shorter focal lengths up to about 8 in. or so will be more convenient, besides being cheaper. This size of lens is designed to cover a film 5 in. by 5 in., and would probably cover a half-plate ($4\frac{1}{4}$ in. $\times$ $6\frac{3}{4}$ in.) if slightly stopped down.

Lenses having an aperture of f/4 and a focal length of 5 in. are used on cameras employed in torpedo training; these produce a panoramic picture 2 in. wide by 7 in. long, but they are probably equally well suited to cover frames of more normal shape. While it would be possible to produce lenses specially corrected for covering panoramic strips, the production processes would be much more complicated, and the setting of the lens in the camera would be more difficult and critical.

The lenses fitted to the "gun cameras" used for aerial gunnery training are of 2 in. focal length with an aperture of f/3.5, and although required only to cover a very small area, that of a 16 mm. cine-film frame, it has been found that they will, in fact, cover the 35 mm. double frame size as used in most of the popular miniature cameras —approximately 1 in. $\times$ $1\frac{1}{2}$ in. Some of these lenses are equipped with supplementary long-distance attachments, virtually telephoto lenses, which enable distant objects to be considerably magnified. These lenses have the disadvantage, from the aspect of general photography, of having no iris diaphragm to adjust the area of the aperture, but this can be overcome by remounting the lens cells in a suitable mount equipped with some form of stop diaphragm. Care must be taken to preserve the correct distance apart of the actual lenses, and the position of the diaphragm relative to them.

It may be remarked that the gun camera, which is obtainable complete, consists of a motor-driven cine-camera taking 16 mm. standard film in a special form of charger, which incorporates the actual film gate and is easily loaded into the machine. The electric motor fitted is the miniature tripolar armature type illustrated in the November 6th, 1947, issue, and runs on 12 volt or 24 volt supply.

Projection Lenses

As photographic lenses call for the highest degree of optical precision, it may be taken for granted that any lenses referred to may be used also for projectors such as photographic enlargers, diascopic lanterns or episcopes. In the former case, the requirements are much the same as for camera lenses, but somewhat less exacting; for lanterns and episcopes, a moderate degree of correction is tolerated, but aperture must be large to make the utmost of the available light. A lens of f/2.9 aperture represents something approaching the ideal in this respect.

Telescope Lenses

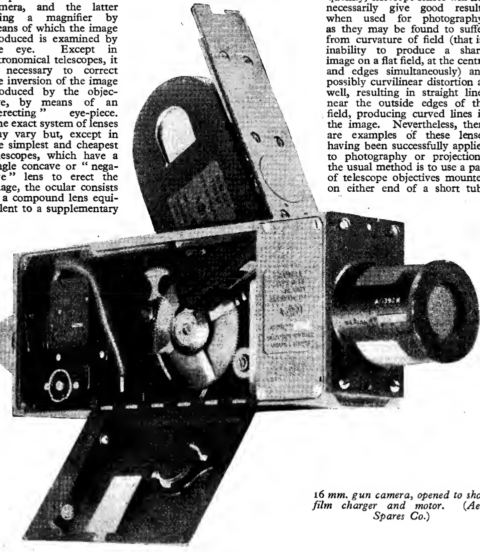
A number of lenses are available from telescopic sights and similar instruments, and these also are highly corrected for their particular purpose. In some cases the complete instrument is available, and can be used without alteration, as a high-power telescope; other instruments in this class, such as periscopes, contain, in

addition to the essential lenses, prisms which enable the rays of light to be reflected or refracted through various angles. The normal form of telescope contains two ens systems, the "objective" and the "ocular" or eye-piece, the former being the image-forming lens, comparable to that of a camera, and the latter being a magnifier by means of which the image produced is examined by the eye. Except in astronomical telescopes, it is necessary to correct the inversion of the image produced by the objective, by means of an "erecting" eye-piece. The exact system of lenses may vary but, except in the simplest and cheapest telescopes, which have a single concave or "negative" lens to erect the image, the ocular consists of a compound lens equivalent to a supplementary short-focus telescope or a low-power microscope.

In most high-class telescopes, the objective lens consists of what appears to be a single lens, convex on both sides, but it is really a combination of two or three lenses which fit each other closely, and are cemented together. These lenses are made of different kinds of glass having various dispersive properties to produce colour correction, and such lenses are said to be "achromatic."

The correction of a telescope objective lens is different to that of a photographic lens, as it generally works at a narrower angle, and produces a "virtual" image to be viewed with the eye, as compared to an "actual" image on a flat surface in the case of the camera lens. Consequently, telescope lenses will not necessarily give good results when used for photography, as they may be found to suffer from curvature of field (that is, inability to produce a sharp image on a flat field, at the centre and edges simultaneously) and possibly curvilinear distortion as well, resulting in straight lines near the outside edges of the field, producing curved lines in the image. Nevertheless, there are examples of these lenses having been successfully applied to photography or projection; the usual method is to use a pair of telescope objectives mounted on either end of a short tube with a diaphragm or stop mid-way between them. This produces a "doublet" lens of approximately half the focal length of each of the single objectives; the opposition of the latter will generally cancel out curvilinear distortion and possibly certain other errors, but the system will only work properly over a narrow angle and at a moderate aperture.

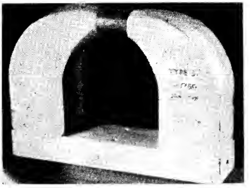
The lenses from both the objective and ocular systems of telescopes make excellent magnifiers



16 mm. gun camera, opened to show film charger and motor. (Aero Spares Co.)

for such purposes as reading maps or vernier scales, focusing magnifiers, or watchmakers' eye-pieces. The degree of magnification is, of course, in inverse ratio to the focal length of the single lens or combination of lenses employed.

These lenses generally have a fairly flat field giving less distortion near the edges than the ordinary magnifying lens, and their colour correction eliminated the "rainbow fringes" produced by the latter.



A powerful permanent magnet, suitable for laboratory or classroom demonstration use. (*Aero Spares Co.*)

A small doublet eyepiece lens of approximately 1 in. focal length by Dallmeyer, fitted to a mount with a right-angle prism, was obtained recently from Aero Spares Company, and proved to be highly suitable as a projection lens for 8 mm. cine-films.

A Laboratory Magnet

Reference has already been made to the many uses to which various kinds of small magnets found in dismantled apparatus can be applied, but here is a type of magnet which comes into rather a different category. The Aero Spares Company now have for disposal some very large and powerful permanent magnets made in Alnico or similar alloy steel, which are presumably designed for laboratory use. These magnets are so powerful that it is quite a feat of muscular strength to remove the keeper from between the poles, and even more difficult to hold it steady within 1 in. or so of the poles. A magnet of this type would be ideal for classroom demonstration and is also useful for magnetising small instrument magnets, compass needles, etc.

Holiday for Ploughshares

It is considered appropriate at this stage to give this subject a rest, not because it is exhausted, but because its primary purpose of bringing to the notice of readers the many uses to which surplus apparatus can be applied, has now been served. It was fully expected, when the series of articles was first proposed, that the subject would be open to criticism in some quarters, but in fact very little in the way of adverse comment has been encountered. On the contrary, innumerable readers have written to say how helpful the articles have been to them in enabling them to adapt and construct valuable items of equipment and in stimulating their own powers of improvisation. Some readers have already contributed articles dealing with their own efforts in this respect and more are expected to come forward in the near future.

While the regular series of articles on this subject is now terminated, it should not be thought that the matter is definitely and finally closed; any new information of general interest, whether in respect of apparatus which may become available or ways in which it may be applied, will be dealt with in separate articles.

Acknowledgments are made to all who have helped to make these articles possible, including the firms who have provided facilities for examination and test of apparatus, and readers who have supplemented the available information on the original design and purpose of apparatus, or made valuable suggestions for its adaptation to new purposes.

For the Bookshelf

Practical Photomicrography, by R. F. E. Miller. (London: Percival Marshall & Co. Ltd.) 101 pages, size 5 in. by 7¼ in. Fully illustrated. Price 5s. od. net.

Natural history, in all its many phases, is a prolific source of recreation to the enquiring enthusiast; and photomicrography, without question, is one of the most fascinating and satisfying of the many pastimes derived from nature-study. The author's approach to the subject, however, is primarily elementary, in that it guides the merest novice into the way of obtaining perfectly satisfactory results from the simplest of apparatus. This must not be taken to mean that good results can be obtained from poor-quality apparatus; but it means that the lack of an elaborate microscope and optical gear need not deter the experimenter from attempting to pursue an unfamiliar branch of his hobby. Almost any microscopist desires to keep permanent visual records of his observations; but not everyone is possessed of the means of doing so, and this book, with its practical instructions for making simple apparatus for the purpose, shows how the difficulty can be overcome without heavy financial outlay. The constructional illustrations, in line and half-tone are essentially helpful, while the actual reproductions of photomicrographs are extremely interesting in themselves and convincing as to the possibilities of the apparatus used.

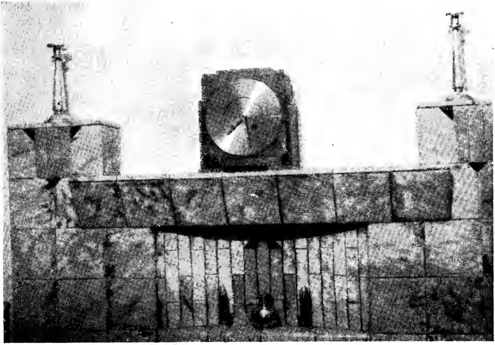
A New Life for an Old Clock

NO doubt many readers will have somewhere in their houses one of those old marble clocks so beloved of our parents' generation with the twin columns of brass fretting which nearly always decorated this form of clock. Usually, too, was an impressive plate fixed to the base on which was engraved the good wishes and felicitations of the party of friends from whom the clock emanated. Although these clocks often had good movements, unfortunately their ponderous and heavy design unsuited them to the modern house with its lightly built shelves and mantelpieces.

Having been deceived by faulty time shown by electric mains clocks during the recent power cuts, I decided to resurrect and rebuild into modern form a clock which has rested in a lumber room for many years.

The movement was taken out of its heavy case and thoroughly cleaned (it was made by a Paris firm long defunct), and the beautiful workmanship appeared to be in perfect condition. The hands and face were then taken off and a face of modern design was turned up and engraved in the lathe from 3/32-in. brass plate. Coppered hands of a similarly simple style were then cut and fitted. The clock was even now acquiring a " new look."

The case was then taken in hand. It was made of a particularly pleasing specimen of green onyx cemented together with some form of plaster-of-paris cement. With some trepidation, a wooden mallet and a little careful prising with a small screwdriver, the case was knocked apart, particular care being taken to secure the square front section intact in which was cut the circular opening for the movement. A very interesting Sunday evening was then spent arranging the



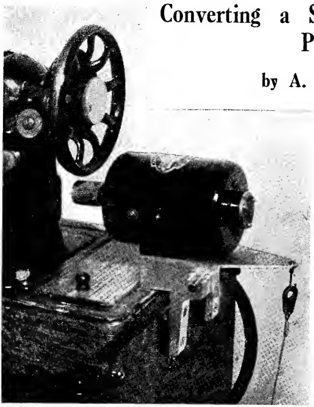
pieces into a modern form of clock case without having to cut any of the onyx which is treacherous material to work.

A style was finally decided upon, the pieces were then cemented to an inner plywood case with Bostic " C," the joints and intersections were filled with " Alabastine " suitably coloured to match the case, and the movement was introduced to its new case although some careful wangling was required to include the gong of the striking movement. The original hinged back was used after a thorough clean and polish. All exposed metal work was given a very fine coat of clear cellulose lacquer and the case a final polish with metal polish and a soft cloth.

The clock now keeps time to about a minute a month, but with a little careful regulating this can be improved upon. Although the photograph shows but poorly the finished result, it will be agreed that it is difficult to recognise the forty-five year old article which had not lived long enough to attain value as an antique but has now embarked upon another lease of useful life.—H.R.V.

Converting a Sewing Machine to Power

by A. R. Turpin



MOST women who do much sewing yearn for a motorised sewing machine, and those who are lucky enough to eventually obtain one wonder how they ever managed efficiently with only one hand to guide the material, to say nothing of the labour involved when such things as large curtains have to be hemmed.

The desire of the writer's wife for such a machine at a time when obtaining supplies were even more difficult than they are now, to say nothing of the cost, led to some thought on his part.

The specification laid down was as follows :—

The sewing machine must still be capable of hand operation if desired.

Speed control should be possible from 30 to 300 r.p.m.

The fitment must be cheap and the construction simple.

It must be possible use the existing cover and replace same in a few seconds.

The apparatus must be portable.

The first prototype was designed for fitting to the kitchen or dining-room table, and was easily removable so that either room could be used. Later, when some timber became available a self-contained portable stand was constructed. Both schemes will be described.

The first requirement is an electric motor of about 1/20th h.p. This should be of the constant-speed type, rated at about 2,750 r.p.m. The writer used an induction motor manufactured by the Klaxon Co. Ltd., but this type of motor is a standard product of most motor manufacturers.

To the base of this motor is fixed a plate of 12-s.w.g. brass, bent as shown at "A" Fig. 1, with a $\frac{5}{16}$ in. diameter spindle "B" passing through the two sides in such a position that it is slightly behind the centre of gravity. This spindle is silver-soldered into position.

The rear of the plate is cut to a triangular shape and a $\frac{1}{8}$ in. diameter hole is drilled in it "C," of which more later.

Next, two brackets "D" are made from castings, or bent up from $\frac{3}{8}$ in. × $\frac{3}{4}$ in. mild-steel strip. The length of these brackets should be such that when the motor and baseplate is resting in the bearings, the flywheel of the sewing machine is approximately above a point halfway down the motor spindle.

In the drawing the motor and flywheel are shown chain dotted.

Now if we fit a rubber wheel to the motor spindle, and the motor is tilted by pressing on the triangular projection on the baseplate, the rubber wheel will gradually impart the drive to the flywheel as the pressure is increased.

If we now hook a length of steel wire to the hole in this projection and connect it *via* a tension spring (see Fig. 2 "E") to a lever "F," which in turn is connected *via* a shaft to a foot pedal "G," we may engage and disengage the motor by the pressure of our foot on this pedal.

The danger of undue force being applied is guarded against by the give in the tension spring and the foot pedal coming in contact with the floor. The foot pedal and shaft are secured to the bottom of a table leg by clamping the two bearing plates "H," by means of the bolt and wing-nut "J."

The second bolt "K" having been set to the correct distance by trial, the foot pedal and lever are secured to the shaft by Allen grub-screws or by means of a split bearing described later.

When not in use the motor is simply lifted from its bearings and stored, the connecting steel wire having been unhooked and strained over a wood screw driven in at the top of the table leg and hooked to a second screw lower down. This draws the foot pedal and lever into a vertical position and out of the way, or alternatively the whole attachment can be quickly unclamped and detached.

If the sewing machine is to be used in one room only, it might be better to make plates as shown in Fig. 2. These can be cut from $\frac{1}{8}$-in. plate and screwed permanently to the table leg. If desired, the foot pedal and shaft can quickly be removed by loosening the Allen grub-screws and withdrawing it complete with shaft.

For those who wish to make a permanent stand, a drawing (Fig. 3) and photograph are shown. The drawing shows the stand with the motor removed and the steel wire on its parking-screw. The drawing differs somewhat from the photograph and shows some suggested improvements, and it should be pointed out that whereas the bearing brackets, "D," Fig. 1, are screwed directly to the base of the sewing machine, in this case they are fixed to the side of the stand. In the photograph, the connecting wires from the motor go to a junction box, but in the drawing the wires go to a plug of a three-pin socket and switch mounted flush in the side of the stand.

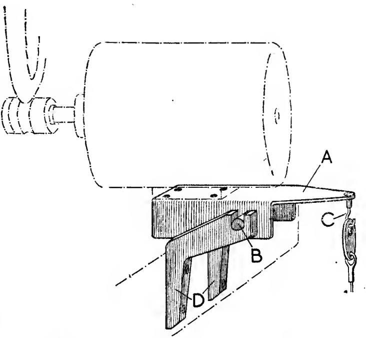


Fig. 1. The motor mounting when fitted to sewing machine base

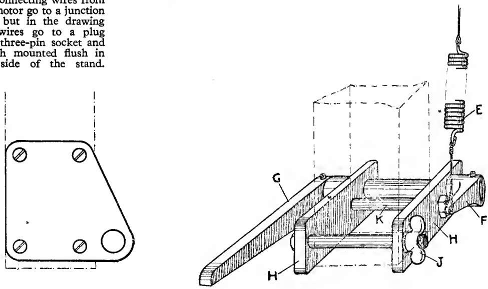


Fig. 2. Method of clamping foot pedal to table leg

This enables the motor to be packed away and not parked permanently on the stand.

Hand holes on the stand side are also shown; this is to enable a grip to be obtained when wheeling the stand about from room to room.

The operating lever is fixed to a shaft $\frac{5}{8}$ in. diameter, which passes through a hole in the side of the stand which is reinforced on the inside by a steel plate $\frac{1}{8}$ in. thick drilled for the shaft to pass through and fixed to the stand side by two countersunk wood screws. The foot pedal is an 8 in. length of $1\frac{1}{4}$ in. $\times$ $\frac{1}{2}$ in. mild-steel with a

hole drilled at one end to take the shaft, a saw cut is made from the rear into this hole and a $\frac{1}{4}$-in. hole drilled and tapped at right-angles so that the pedal may be clamped in any position on the shaft, see detail Fig. 3.

The stand may be constructed of any suitable timber about $\frac{3}{4}$ in. thick and can be simply screwed and glued together. The flap on the left is hinged so that it may be folded down when not in use, the bracket being hinged also so that it may be swung to one side to enable the flap to drop.

The wheels came from a cheap stores and are threaded on to a $\frac{5}{16}$-in. axle which is supported by a bracket made from $\frac{1}{8}$ in. $\times$ 1 in. steel strip. The ends are bent at right-angles and holes drilled to accommodate the shaft and further countersunk holes are drilled for securing it to the side of the stand. The wheels are held on the shaft by split-pins and washers, $\frac{1}{16}$-in. holes being drilled to take the split-pins. Wheels are only fixed on one end of the stand so that it will not slide about when in use. Remember to make one side slightly shorter than the other to allow for the height of the wheels.

The rubber wheel for the motor was made as follows :—

First slip over the spindle a short length of $\frac{1}{4}$ in. rubber tube and over this a $1\frac{1}{4}$ in. length of garden hose. It does not matter if the hose is corrugated, as it will soon wear smooth to the shape of the flywheel and will last about 100 hours' sewing, and can be renewed in a few seconds.

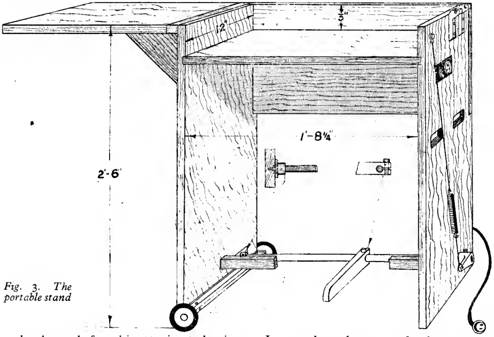


Fig. 3. The portable stand

It may take an hour or so for the user to get used to the operation of the machine, but once the "feel" has been mastered it will be found to be quite simple to drive at any speed within the specified range.

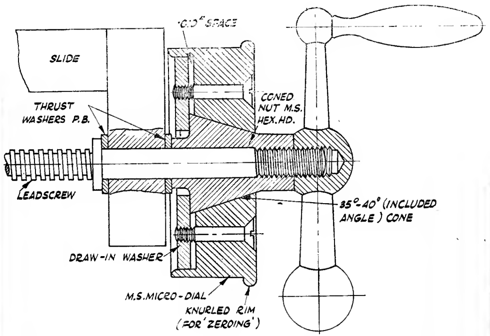
Friction Control for Micro-dials

by T. P. Arnott

I HOPE this device, which I have used for years, will be of use to other modellers, as it seems to me that quite a lot of mis-applied ingenuity has been concentrated on this particular item, both by lathe makers and knowledgeable amateurs, resulting in a galaxy of ideas incorporating springs—coil and flat—plungers, and so on and so forth.

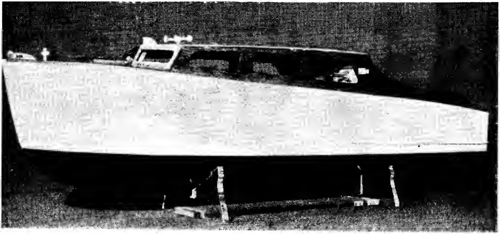
If this type is properly made in the fit of the cones, it will maintain a consistent friction "feel" for a very considerable period without adjustment, and will not shift under the heaviest vibration, such as when using a big multi-toothed milling cutter on a cheap lathe. It calls for no difficult machining, and those with no degree calibration on top-slide base need not worry, as around 35-40 degrees is O.K., so long as the male and female cones are turned at the same angular setting. Cones should be "ground in," using a soft or soluble and fine abrasive.

I find the coned leadscrew thrust adjusting-nut is best fitted to the L.S., as sketch, that is, with a plain portion a good fit on the shaft and a small part threaded to mate with end of the L.S. thread. This gives dead-true running of the dial. The dial can be locked solid with this nut, if required, by tightening the washer screws right up. Reversal of the cones makes the job easier, as the dial taper can be machined at the same setting as the turning, and calibration, when using the time-honoured method of a "V" tool on its side and shaping the graduation grooves by working from dial edge inwards.



For dead true running of dial, use the "screwed-parallel" fitting of the coned thrust-nut to leadscrew end, as shown

A refinement for those who do not care to use a screwdriver for adjusting, would be to replace the washer and screws with a knurled nut of the gland type, but this would have to be a really good fit in its thread to obviate the nut being pulled round when "Zeroing," and thus altering the friction fit. When assembling, oil the cones. Actually, when the washer is arranged on the outside of the dial (reversed position to sectional sketch), it still looks quite neat, if a suitable recess to house it flush with the dial is used. Being free from screw heads, etc., the whole width of the dial rim is available for the calibration markings.



" *Chiquita* " : *an unfinished 24 in. cabin cruiser, with 2-c.c. "diesel" engine. Built to 1 in. scale by W. J. Hughes*

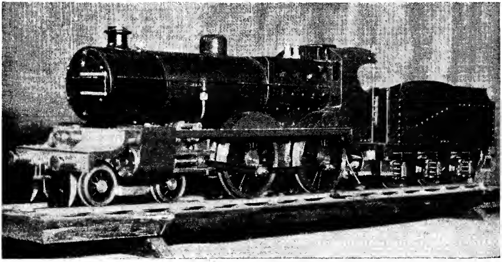
SHEFFIELD'S FIFTH EXHIBITION

THE Fifth Exhibition of the Sheffield S.M.E.E. was even more successful than the 1947 show (which in turn had been better than *its* predecessor). It was, in fact, a most effective reply to those "doubting Thomas's" in the society who had thought that there would not be enough interest from the general public adequately to support an annual exhibition: the attendance was over 10,000, as against 8,000 last year!

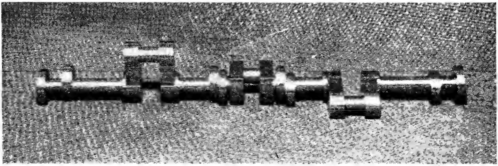
The total number of exhibits was somewhat greater than in 1947, too, despite the "basic" problem of transport! In this connection, however, we were granted extra petrol units for the purpose of collecting heavy and unwieldy models.

As in our former exhibitions, we were happy to have the co-operation of the Sheffield Ship-model Society, the Sheffield Society of Aero-modellers, and the Sheffield Model Yacht Club. In the supply of both exhibits and stewards, these clubs performed excellent service, and it is difficult to visualise a Sheffield exhibition without them.

We were honoured to number among our visitors the editors of three of the journals devoted



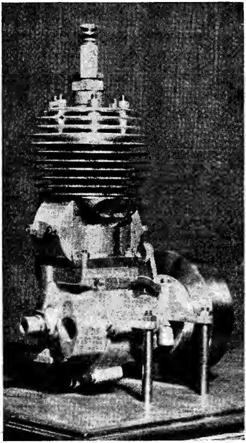
J. H. Hatherley's "first attempt" at locomotive building—" Annie Boddie" in $2\frac{1}{2}$ in. gauge

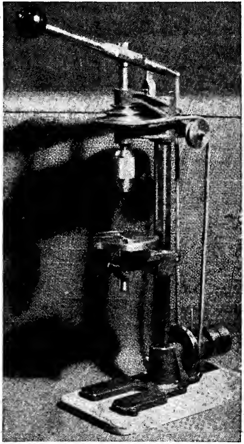


Component for a " period piece "—R. A. Barker's crankshaft for a 3-cylinder oscillating paddle engine

to our hobby, and it was a pleasure to greet again old friends from the Chesterfield, Lincoln and Buxton Clubs, and the West Riding Small Loco Society—not forgetting Mr. Waterhouse from Wigan. It is pleasing contacts such as these which the " lone hand " cannot know!

Many models were working under compressed air, kindly supplied by the British Oxygen Co., while diesels and small petrol engines frequently added to the noise. The 60 ft. passenger track was in operation throughout the show, as was the " OO " gauge track. The accompanying photographs show a representative selection of the exhibits in general.





Left—A 30-c.c. " Atom V " engine (unfinished) by S. Merrill. Right—A useful addition to any workshop—W. H. Naylor's ½ in. capacity drilling machine. To " M.E." design, with variations